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An Inaugural Essay
on
The cause of yellow Fever
by
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of
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The disease, which, perhaps more than any other, has attracted the notice of physicians, of the public, and particularly of the inhabitants of our own country, is that which is usually denominated "yellow fever". It has committed very extensive ravages in human life, throughout all warm latitude, whether inter or ultra-tropical, from the eastern frontier of China, through farther and hither India and the Indian Archipelago, Persia, Arabia, and the eastern and western Coasts of Africa, the West India Islands, and the countries bordering on the Gulph of Mexico.

Throughout this extensive range of territory, the sources of this formidable disease exist in a great degree, frequently accompanied by those favourable and ascertained circumstances which are essential to their activity and destructive influence, and which are of only occasional occurrence in regions beyond these limits. Here then it prevails with varying degrees of violence through all the gradations of universality from a sporadic disease attacking but a few

individuals, up to a wide spread epidemic whose track is marked by destruction and death. But the ravages of this scourge have unhappily not been confined within the boundaries which have just been mentioned. Its cause has found "a local habitation" in almost every region. Yellow Fever has, at times, prevailed with epidemic violence throughout these United States, at Copenhagen, in Holland, in the Netherlands, in Austria and Hungary, in the southern cities of France, in Spain, Italy and Greece.

In all these places its existence is recorded at as distant a period, be it remembered, as medical history extends to, appearing under precisely the same nature, manifesting the same phenomena, governed by the same laws, and prevailing under the same circumstances of situation and season as at the present day.

Of an epidemic, so extensively prevalent, and which has become interesting to us by sad and frequent experience, it is of consequence that we should be acquainted with the cause, in order that those, who preside over the health, and thereby the

happings of their fellow men, may, if practicable, remove it. This is a subject on which medical opinion has been much divided, and which has been disputed with ardour and even acrimony. The two principal opinions, and those alone which it is necessary to notice, are those which refer the origin of the disease to marsh miasmata and to contagion. There are some indeed who think they can reconcile the conflicting statements and creeds on this subject by asserting that the disease originates naturally from marsh miasmata, but may acquire a contagious property by such circumstances, as crowding, filth, and deficient ventilation. This is obviously a gratuitous assumption, ~~[illegible]~~; for if the disease ever arise from one of those causes, it is certainly never produced by the other: it cannot have both a miasmatic and a contagious origin. Though from the almost infinite number of publications on the subject of the cause of yellow fever, it is impossible that my acquaintance with it can be otherwise

than partial, yet my reading has been of those au-4
thors who are looked upon as the pillars of their res-
pective sides of the controversy, and who have no
doubt done justice to their cause. From such sources
of information, and with such fair means to fix
my belief on either side of this controverted question,
I must unhesitatingly and unqualifyingly declare
that I do not know a single fact or argument to
countenance the belief that the yellow fever ever
was in a single instance communicated from one
individual to another; that it ever originated from
any other source than miasmata; or that its nature
is not the same as that of intermittent and remittent
fever, from which it differs in degree of malignity
alone. On the contrary I believe that there is almost
an unparallelled accumulation of incontrovertible
testimony, as well authenticated as that which sup-
ports any the most firmly established opinion; and
infinitely more complete and conclusive than what
is capable of being adduced in proof of ninety nine
hundredths of accredited and universally admitted fevers

modern) historical facts, in support of the belief that yellow fever has always arisen from vegetable miasmata; that it is of the same nature as intermittent fever; that it always has been, and always will be, equally incapable ~~with it~~ of being generated ~~and~~ ~~[illegible]~~ ~~[illegible]~~ or propagated by a specific contagion. That yellow fever arises from vegetable miasmata I infer from the same grounds from which I infer the miasmatic origin of intermittent and remittent fevers, viz that it never appears except in places and at times when these miasms exist in a certain degree, and that it never fails to appear at such times and places, and that the same is untrue with respect to every other alleged cause.

"In Jamaica" says Dr Hunter, "the fevers in the most healthy seasons are generally intermittent; in the rainy and other ~~[illegible]~~ unhealthy seasons remittents!" In temperate climates, regular intermittents prevail in mild seasons; but if the heats increase in intensity, or the sources of miasmata be very abundant and the individuals be either much exposed or unacclimated, the paroxysms will be more violent and protracted into a

remittent or even a continued fever. This is proclaimed throughout the whole of Sir John Pringle's volume, "The epidemic of autumn," he tells us, "and prevailing distemper of this (the Netherlands) and other marshy countries, is a fever of an intermitting nature, commonly of a tertian form, but of a bad kind; which, in the dampest places, and worst seasons, appears as a double tertian, a remitting, a continued putrid, or even an ardent fever." Again, "In proportion to the coolness of the season, to the height and dryness of the grounds, this fever is milder, remits or intermits more freely, and recedes further from the nature of a continued putrid, or an ardent fever." (p. 7) Speaking of the bilious fevers of the marshes, the same author observes, "These marsh fevers are not only apt to begin with little remission, but after intermitting for some days, to change again into continued fevers of a putrid and malignant nature; It is remarkable how much they vary with the season; for however frequent, violent or dangerous they have been in the decline of summer or beginning of autumn, when the putrefaction is at the height, yet before winter they are reduced to a small number,

become mild, and generally assume a regular tertian form."
(p. 156) I might were it necessary extract from the same author numerous other passages of similar import. His description of the bilious fever of the camp and of the marshes shows that it varies in its degree of malignity, from a simple intermittent through all the intermediate gradations up to a putrid continued fever, according to the intensity of its cause, the season, the situation of the men, and the other accessory causes.

Lind has inculcated, throughout his whole work, the same opinion; and Dr Rush mentions that "the different grades of bilious fever, from the mildest intermittent to the most acute continued fever, have been distinctly traced by Lancisi to the same marsh exhalation"

The regular intermittent therefore may be considered as the endemic of temperate climates and seasons; and though it often prevails among the natives in tropical regions, when the sources of miasmata are not very concentrated, or the heats intense, as on the mountains of the West Indies, it is never found epidemic in the neighbourhood of the equator. It is in these extensive and

unhealthy regions, that the remittent fever prevails, during the long season of sickness, with great and often destructive malignity. This is the grand epidemic, the morbus regionalis of equatorial latitudes, and rises into a continued or yellow fever in summers of unusual heat particularly among those not perfectly assimilated to the climate. It is this, that in its aggravated form, has cut down, the swarms of colonists from the North of Europe, that for some centuries past have been poured upon these unfriendly settlements. The Dutch have melted away before the annual sweep of this malignant pestilence on that speck of Earth where they have fixed their Indian capital, the hot bed of disease, where "all life dies, death lives." But Great Britain has perhaps most reason to reflect with sorrow on its destructive ravages. Wherever in intertropical regions, British enterprise has extended British dominion whether throughout the peninsula of India, on the coast of Africa, or in the unhealthy seaports of the West India Islands, there has she beheld the bloom and health and vigour of her country falling by, piecemeal before this relentless malady. It appears that several conditions

are necessary to the existence of yellow fever, so that its prevalence in any place is dependent not on an individual agent, but on a concurrence of circumstances, viz the sources of the miasmata of vegetable decomposition, a steady preduration of high atmospheric temperature, and that degree of susceptibility or absence of insusceptibility natural to the inhabitants of climates subject to a considerable annual range of temperature, That the origin of yellow fever is to be found in the concurrence of the circumstances I have mentioned, is, I think clearly made out by the authors whom I have read on the subject, but as every inch of this ground has been an object for dispution, it will be proper, without a formal citation of facts, which would be an endless task, to refer to a few of the sources of proof in order to exemplify its nature, and to state some of the general consequences deducible from it.

Dr Bancroft has, with much research, traced the history of yellow fever in many of the West India Islands, in nearly all the large towns of the United States, and in those cities of Spain in which it has prevailed as a malignant epidemic. He has given the topography of each

of these places with great minuteness, In all of these situations, he has pointed out very copious sources of the miasmata of vegetable decomposition, marked the limit of the offending cause and shown that the disease has never transcended the boundary assigned, conformably to the circumscribed extent, beyond which, as I have already illustrated, there is the most convincing proof that the vis noxeus is incapable of being borne by the atmosphere with the retention of its morbific efficacy, The same author has pointed out the sources of Marsh miasmata on ship board, and has given a number of instances in which he has placed it beyond a doubt that yellow fever originated from such sources under a cooperation of the other agents which are indispensable to the effect in question, In many of the medical journals of this country particularly the New York medical Repository are to be found histories of the yellow fever as it has appeared at various times in different parts of the United States, in all which that I have seen, very copious sources of Marsh miasmata have been shown to exist at the very seat of the epidemic, I find, in Dr James Johnson's work on tropical

climates, accounts of the prevalence of yellow fever in some parts of the Indian Archipelago, at Seringapatam, in Bengal, &c — all which places he describes as abounding in marshes and other materials for vegetable decomposition; yet such a disease is unknown throughout the whole sandy coast of Coromandel. But it is not enough for the production of disease that there be vegetable matters unless they are in a situation to suffer decomposition. Miasmata must be evolved during the putrefactive process before marshy soils can morbidly affect health. It is along the drying margins of streams of water, which have recently been exposed to the sun, in consequence of the subsidence of the waters or their gradual removal by evaporation that miasmata can be formed in sufficient concentration to produce disease. When there is a superabundance of moisture, they are either prevented from being generated, or they are perfectly inert and inefficient from their rarity and dilution.

In temperate climates, where the heats are moderate and evaporation slow, vegetable matters require but little moisture, beyond what is inherent in them in order to undergo decomposition. But where the heats are intense

and evaporation very rapid, any superfluous moisture will 12
soon be vaporized, and leave the organic matter exposed to
the chemical agency of the sun. Hence we find that in
tropical climates, soils naturally dry do not send up their
morbific effluvia till, after the periodical rains are over,
they are far advanced in the drying process, and sometimes
completely exsiccated. At such times, intermittent and
remittent fevers make their annual appearance in these
situations. Two requisites therefore for morbific miasmata
are rarely absent, during a part at least of the year, in
the generality of places, and atmospheric temperature, which
forms a third, is almost annually present, during the sum-
mer months in intertropical latitudes, and occasionally
so in many ultra-tropical countries in a degree to
generate marsh effluvia of sufficient concentration
to give rise to the milder gradations of miasmal diseases.
But, for diseases of a higher and severer mark, such
miasmata are per-se too weak and dilute under that degree
of relative unsusceptibility possessed by natives and those
habituated to a higher temperature. In such systems,
the poison is incapable of effects so deleterious. Providence

has so graduated the relation between the excitability of the native and assimilated system, and the stimulus of the virus, as that noxious agents of such perennial existence in all warm latitudes may be incapable of extinguishing the noblest of his works. Consistently with the preservation of the human species, marsh effluvia of sufficient concentration to exalt their morbid consequences through all the gradations of miasmatic disease from simple intermittent up to malignant yellow fever, must be of only occasional existence. Accordingly we find that nature has kindly confined their production within certain ranges of atmospheric temperature, which are of infrequent occurrence. Were ordinary degrees of heat operating upon vegetable matters capable of generating yellow fever, it would be found to appear upon the recurrence of every summer in more than half the countries in the world. It requires for its production, as has been already stated, a previous duration of unusually high temperature. It therefore, as before observed, rests very much with the degree of heat to determine its existence in

any place. This is the great regulating agent which 14
limits its appearance down to a mere occasional visitation, moderate temperature produces a poison powerful enough for intermittent; a higher temperature is necessary for remittent; whilst one unusually exalted is indispensable for an epidemic yellow fever.

That this should be the case, would, a priori, be expected by one who believed in the identity of nature and diversity of degree only of these diseases; the reality of which identity I shall make it my business presently to illustrate in order further to confirm the correctness of the assignment of yellow fever to a miasmatic origin.

But, the dependence of yellow fever upon a steady inoculation of high atmospheric temperature in miasmatic districts, or rather upon vegetable miasmata of such a degree of concentration as is incapable of being produced without the agency of such a temperature, is to be positively proved by a reference to facts alone. In all the numerous histories of epidemical yellow fever collected by Dr Bancroft, and which are not culled for a particular purpose, but are all that

he could find recorded with any degree of accuracy and me-15
nutency in the space over which he has passed, are found
statements of the temperature, previous to and during the
prevalence of the disease and also upon its decline and
cessation. These are all from authentic sources, and
many of them official, so as to place their correctness
beyond the possibility of suspicion. In every instance
the temperature was steadily unusually high for some
time previous to the appearance of the epidemic and also
during its continuance, and in no case did the disease
decline till the reduction of the temperature, at which time
it uniformly ceased. So certainly is this the case at Philada
that it is a matter of mathematical accuracy; for it
has been ascertained by records of temperature since the
year 1793, that, in that city, yellow fever has prevailed
every summer in which the average heat of June and
July has exceeded 79 degrees, and that it has proved most
destructive when the thermometer has indicated the greatest
elevation. Without descending further into particulars,
suffice it to say that in every history of an epidemic
yellow fever in which the degree of temperature has been

recorded, it has been stated to have been maintained for a long time at an unusual height at the seat of the disease, and to have declined and ceased on the supervention of cold. As this state of the atmosphere is attended with long continued droughts the vegetable world is generally a partaker with man in the wide spread calamity, and is often the unwelcome harbinger of the sequel.

I am aware that there is much ground for misapprehension on this subject, and that so general a deduction is liable to misinterpretation. It has been judiciously remarked by Dr Dickson that, in climates where the temperature is variable, results, drawn from the greatest and smallest elevations of the thermometer at certain periods, give no information respecting the mean temperature; for, from inattention to this point, in discussing the question whether the heats might be considered as extraordinary in epidemical seasons, it has been affirmed that the heat was greater in some healthy, than in unhealthy years, because the thermometer rose a few degrees higher in the former than in the latter. The same author tells us that in the Carribean Archipelago the temperature is not only high, but equably and durably so;

and from its little variation in this respect, he considers the 17
yellow fever as the legitimate product of the climate; for
in the more southern colonies on the Continent, where,
from the vicinity of wood, mountains &c; the temperature,
though often as high, is not uniformly so; and where
the winds are more variable, and the nights cooler, the disease
is much less prevalent, and oftener assumes a remittent type.

The college of Physicians appear to have fallen into an
error on this point in their report to the Privy Council,
wherein they express the belief that yellow fever may prevail
in Britain, because, they say, the temperature of Gibraltar
when the disease prevailed there fell short of the average
summer heat in England, But in refn. to this statement,
it has been well observed that in those places in
North America and the Spanish Peninsula, which
have been occasionally visited by the epidemic, the me-
teorological observations concur in the pre-existence of
high atmospheric temperature for many weeks before
its appearance; whilst temperature to this requisite
extent seldom obtains in England, and when it does
occur in a climate of so mutable a character, is very

transitory, such evanescent influence is totally inadequate to the production of the disease. Another avenue for the admission of error into our estimate of the degree of temperature in any situation is the presumption of its equality under equatorial parallelism and propinquity of locality. The difference between corresponding latitudes in the two hemispheres has been estimated at between 12 and 16 degrees, and the dissimilarity of climate, even between the eastern and western sides of the New Continent, is sufficiently great to reflect a very striking influence over the malignity of disease. At Lima, for example, which is but a little farther on one side of the equator than Carthagena is on the other, the heat is far more moderate; and at Quito, though close to the line, the thermometer does not rise so high in summer as it does at Paris. On the opposite side of Mexico, where the distance is much less than across the other parts of the continent, the effect on disease is so considerable, that while Vera Cruz is considered as the chief seat of the vomito, Prieto or yellow fever, it has never been observed on the West Coast of New Spain, though bilious fevers & cholera

morbus are there found to prevail. Even in the short distance of sixty miles between Panama and Porto Bello, the difference is so perceptible, that, as Ulloa remarks the garrison detachments sent from the former to the latter, "though coming from a place so near, are affected to such a degree, that, in less than a month, they are so attenuated, as to be unable to do any duty, till custom again restores them to their strength."

In equinoctial regions, the effect of elevation is equivalent to that of latitude. The Mexican mountaineers, we are told, in descending the eastern declivity of the Cordillera from Orizaba to the coast, in sixteen hours are transported from the temperate to the torrid zone, and suddenly plunged into the extremely hot and deleterious atmosphere of Vera Cruz and thus exposed to all the dangers of a new and fatal endemical disease. In ascending this elevation, says Humboldt, the sight of the Mexican oak, at the farm of L'Encero which is 3543 feet above the level of the ocean, quiets the alarms of travellers newly landed at Vera Cruz. Its presence demonstrates to them that they have left behind

them the zone so justly dreaded by the people of the North, under which the yellow fever exercises its ravages in New Spain. The difference of temperature between cities and the surrounding country will help to account for the far greater frequency of occurrence of yellow fever in the former than in the latter situations. This frequency has erroneously been supposed to favour the notion of the importation of the disease, and its dependence on contagious communication.

The reality of such communicable power will be considered in its proper place; meantime, the fact of which I am speaking is referrible to another cause, and completely explicable on a different principle. Any person who believed yellow fever to be the result of the combined operation of the circumstances I have mentioned, would at once pronounce, before he was apprized of the fact, that this disease would appear infinitely more frequently in cities than in the country. Large towns endure a much higher range of temperature than the country and at the same time present more rife and abundant materials for decomposition. Like the

West Indies the country is open and in general exposed to cool and refreshing breezes, whilst the towns, as before remarked, are, for the sake of commerce, positioned in low damp situations, in vallies about the openings of rivers and the bottoms of harbours and other large inlets of water, from which the winds are shut out, and where the whole excuvia of the vegetable world accumulate, stagnate, and decay beneath the fierce unmitigated beams of a burning sky. In North America also, the cities are notoriously many degrees hotter than the country, and in seaports especially, the collections of vegetable matters at the wharves send up effluvia of a degree of concentration equal to what is to be met with elsewhere, in those seasons, in particular, which long continued heats and unusual droughts have afforded such materials ample opportunities for decomposition. For the reasons above mentioned, as well as for another very efficient one presently to be noticed, yellow fever always has been and, unlys very different sanitary regulations than what at present obtain be instituted and rigedly enforced, always will be a disease principally of low, crowded, and commercial cities, whilst

the higher and more airy situations have nothing to fear from it, though I could adduce numerous instances in which, during intensely hot summers, it has broken out and prevailed in low miasmatic districts in the interior of the Country under circumstances in which all possibility of importation was certainly precluded. All of our towns, that are situated on low marshy ground, for maratime purposes, particularly those at the South where every thing, even health, is disregarded in the eye of commerce, must during every unusually hot and dry summer be more or less the seats of yellow fever. The ponds and marshes in their immediate vicinity, the large extent of shore left exposed to a hot sun on the subsidence of the tideaons during long droughts, the decayed vegetable materials of which the wharves are composed and the vast collections of organic remains with which they are almost constantly covered and surrounded furnish materials for disease of nearly unequalled concentration when operated upon for a long time by heats of unusual intensity. Rome situated on low ground in the vicinity of marshes, was, during her infancy, frequently subjected to wasting epidemics. When at the

height of her prosperity and magnificence, the marshes were drained and the city preserved free from impurities and filth, it became healthful, and miasmatic diseases were no longer heard of. But when the empire was overrun by the Northern Barbarians, and the aqueducts broken up, Rome became again the seat of frequent and malignant epidemics. Were Roman vigilance and Roman municipal regulations applied to freeing our seaports from the marshy grounds, the alluvial collections, the black vegetable mould which fattens their outskirts, and the organic remains that are suffered to putrefy in vast accumulations at their wharves, they might bid defiance to the ravages of yellow fever, or even offer a premium for its importation within their limits. As they are at present situated, containing within their bosom such abundant materials for disease, exposed every year as they are to a degree of inter-tropical temperature sufficient to develope the milder gradations of miasmatic malady in the native system and one of a severer type in the stranger from a northern latitude, they must remain at the mercy of the season, suffering, as they have heretofore done

a general yellow fever, whenever the heats are unusually and steadily intense, and which will continue till either the gradual supervention of cold, or the salutary deluges from the clouds shall have reduced the temperature, refreshed the atmosphere ~~[illegible]~~ precipitated the marsh miasmata and checked their further production and elevation, and invigorated the animal system. Conformably to the above views, we find that, in all the seaports at the South, the milder gradations of miasmatic disease prevail in the outskirts and surrounding country, whilst yellow fever is rife in the neighbourhood of the wharves. This greater exaltation of temperature in cities affords a solution of the sporadic existence of this disease for some time previous to its sudden bursting forth as a general epidemic, and explains all the erroneous opinions that have resulted from this phenomenon. As the heat of the city is greater than that of the country, the former will have become sufficiently intense to generate yellow fever from the occasional sources of disease within its limits, before the latter has risen to the requisite height to extricate from the marshes, miasmata sufficiently powerful to produce an epidemic. But

if the temperature rise still higher, these latter will send forth effluvia of sufficient concentration to render the disease general: hence a sporadic yellow fever may be produced from local causes before the heats have risen to the height ~~requisite~~ requisite to generate an epidemic, from general sources. The preceding circumstances are I think sufficient to account for the epidemic prevalence of yellow fever wherever and whenever it has prevailed.

I would now offer their absence as a reason for its absence wherever and whenever it has been absent. I think it will explain the absence of the disease in situations free from vegetable matters and in countries in which the heat never attains the elevation and duration which has been specified as requisite to the effect in question. It will explain its absence, in countries subject to it, in those years in which the temperature is not permanently unusually high; its uniform cessation, in summers when it does occur, on the supervention of cold, or the fall of considerable quantities of rain; and the fact of its never prevailing in the winter. We have a right to require of those who believe in the contagious origin of yellow fever, to inform us how these phenomena are solved by their hypothesis.

Accordingly I shall not omit, when I come to consider the merits of that creed as explanatory of the disease in question, to examine whether the phenomena it is universally acknowledged to exhibit correspond with such as we would a priori expect it to exhibit if it depended for its origin and propagation on a contagious principle. There is one important circumstance yet to be noticed before concluding the consideration of the miasmatic origin of yellow fever. I have heretofore been speaking of it exclusively as an epidemic prevailing among the natives of a country. I am now to say a few words in explanation of its appearance as a sporadic disease confined in its attacks to foreigners. In this case, the above conditions mentioned as essential to its existence may appear not to have been complied with, and the disease may seem to have disobeyed the laws which I have mentioned to govern its production; but let it be remembered that the force of stimuli is always relative to the excitability of the system to which it is applied, and that a quantum of virus perfectly inoperative and innocuous in a reduced state of excitability would prove adequate to its derangement or disorganization in an opposite condition. The native system is placed

[illegible]

beyond the influence of climate, and has therefore to contend against the individual agent, the materies morbi alone.

It is only then, when this is unusual and excessive, that it produces malignant effects; which will always ceteris paribus be graduated in intensity proportionately to the intensity of the cause. But the unacclimated and consequently unassimilated has a double agency to contend ~~against~~ against, and his system, debilitated and excited by the influence of a foreign climate, would be unable to resist the power of a stimulus altogether inefficient in the native, and become very morbidly affected by a force incapable of aggravated effects in the latter. The excessive temperature therefore, which has been mentioned as indispensable to an epidemic yellow fever, although it does produce some dispositional tendency to disease in the native as being higher than he is habitually exposed to, is operative principally in exalting the vis noxeus, marsh miasmata, in degree of perfection and concentration. In seasons then of ordinary temperature the native is secure against the malignant gradations of disease; his insusceptibility however is not determinate, specific, or absolute, like that conferred by the

variolous poison, but is altogether relative and contingent; dependent for its duration, on the seasons and, to adopt the language of Mr Sheppard, to be acquired as certainly, though more gradually, by tropical residence, as by having passed through an attack of the disease - a condition of habit which confers security only when the concentration and force of the endemic causes do not exceed the degree to which the individual may have been previously habituated; - and lastly a means of exemption which is liable to be destroyed by the regenerated susceptibility which a return to a residence in a northern climate effectuates. This relative and contingent non hability in the native has been mistaken by some writers for a complete unsusceptibility; and they have accordingly told us that an attack of yellow fever, like that of small pox, confers future immunity. But this is perfectly disproved by fact; and yellow fever, like its kindred miasmatic diseases, intermittent and remittent, is known to attack the same individual repeatedly, and must attack whenever he is exposed to the agency of those circumstances whose concurrence is a sine qua non to its epidemic prevalence.

An attack of yellow fever confers no more immunity

on the system than an attack of intermittent, It contains nothing specific; it is quite ordinary. The relative unsusceptibility is a mere circumstance; consisting only in the reduction of the high, inflammatory diathesis common to all those who are full of vigour and health, and to be obtained as completely by an attack of any other disease, or a course of depletory remedies, or by exposure to any debilitating operation, as by having gone through a fit of yellow fever, The reason therefore is perfectly obvious why a native of the West Indies is rarely attacked by this disease, His climate is nearly uniform; he feels no severity of winter to induce in his system a phlogistic disposition, and thereby create in him a state of susceptibility, which the ordinary intertropical temperature of summer cooperating with the ordinary quantity and concentration of Marsh miasmata, would be sufficient to elevate into yellow fever.

But in seasons of unwonted intensity of heat, he stands as one unacclimated: his system, unaccustomed to such a temperature suffers a reduction of tonicity, and a derangement of function, which, with the contemporaneous augmentation in power of the febrific or noxious agents with which the atmosphere is then supersaturated, expose him, though in

a less degree than the foreigner, to their malignant influence.

In such seasons, and in such alone is yellow fever epidemic between the tropics. At other times, the natives suffer only the milder gradations of miasmal disease, as intermittents and remittents, according as they inhabit the airy elevation or the ill ventilated base-terre, the healthful country or the marshy city. But when yellow fever is epidemic, those, who suffered the disease upon a former visitation, are not the less obnoxious to an attack of it on that account. In this respect, it exhibits no partialities; for all the natives share equally its ravages; each contributes to its insatiable voracity, and may help to furnish it a hecatomb of victims. But as the epidemic visitations of yellow fever in intertropical latitudes are few and far between; much more so than in those beyond the tropics; and as its annual sporadic recurrence among newly arrived foreigners has been confounded with its very rare epidemic appearance among long residents and natives, the exemption of the native in this latter instance has given rise to the hasty and incorrect declaration that the disease confers a specific immunity on the system; and exonerates it for ever from future

liability to an attack. But all the medical historians who 31
have seen and recorded more than one yellow fever epidemic
have not failed to adduce numerous examples of subsequent
attacks; thus disproving the truth of the gratuitous assertion
of a specific unsusceptibility. As we advance gradually
towards the north, the winters increase in coldness, whilst
the heats of summer diminish in a far smaller ratio:
the annual range of temperature is therefore greater, till,
when we arrive in our middle and eastern States, it is
augmented to 80 or 90 degrees, thus our northern years
combine the extremes, elsewhere unknown, of a nearly
tropical summer with a hyperborean winter. This
intercurrency of cold renews the susceptibility which
had been much diminished during the preceding
summer, and will forever prevent our inhabitants from
becoming assimilated in these northern latitudes. A
Philadelphian or Bostonian is therefore always liable,
and may be attacked by yellow fever every year of
his life, just as he and the West Indian may be by
intermittent or remittent; the system is ready for it,
and nothing is wanted save the application of the

nocent power. Whoever deliberates upon these facts may answer many questions and solve many difficulties that have been inconsiderately raised upon this subject.

He will no longer place yellow fever and small pox on the same footing with regard to the influence of susceptibility; but whilst he looks upon one as strictly and exclusively communicated by contagion under all states of the system and all degrees of disposition, and also as conferring a specific immunity for the future, he will regard the other as an epidemic disease, governed, like other epidemics by ascertained and uniform laws; a very high gradation of miasmatic fever requiring, for its existence, a great concentration of the nocent power operating on a system unusually predisposed, and therefore unacclimated; and always equally a seasoning fever whether it attack the native of the tropics or the inhabitant of the North. As, from the coldness of our winters, we are ~~[illegible]~~ always highly predisposed, it will at once be seen why the disease is more frequently epidemic in ultra than in inter-tropical latitudes, and,

as strangers are continually flowing, with all their northern susceptibility, into tropical regions where the temperature is every year sufficient to engender miasmata of the concentration requisite for yellow fever under such a state of predisposition, though not in the native, it will be as easily discovered why it is much more frequently sporadic in the latter than in the former. The same facts satisfactorily explain why a visit to the West Indies during the sickly season is more hazardous to the North American or European than one to the East Indies or the sea ports on the Pacific ocean. In the former case, he is suddenly precipitated, after a few weeks sail from his native shores, ~~with~~ with all his health, and susceptibility into a tropical climate and upon a region rife in the seeds of disease; whilst in the latter, the introduction is gradual and allows the constitution, during a long voyage through hot latitudes, to disinvest itself of a considerable share of its original freshness and disposition by a gradual increment to the temperature of the place of destination, and thereby acquire a partial pre-assimilation. Having now mentioned

the nature of assimilation and its influence over both the sporadic and epidemic prevalence of yellow fever, I will take the present opportunity in anticipation of its proper place, though in order to avoid the necessity of again alluding to this subject, to draw an argument, legitimately deduced from it, in favor of the non-contagion of yellow fever. This disease has been erroneously supposed to be imported by new comers, because they are generally the first and greatest sufferers. But in order to show that this circumstance is entirely referrible to their unassimilation, ~~that this~~ on the principle I have endeavoured to illustrate, and that the infectious atmosphere of the place is comparatively innocious to the natives from habit, whilst it is highly deleterious to the stranger coming from a pure air to a foreign climate, it has been observed that the importation of those who have been accustomed to a similar or a worse atmosphere is perfectly harmless and never followed by the appearance of the disease among them. The exemption of the French refugees in Phila in 1793 is in point. ~~[illegible]~~

The same is remarked by Humboldt, who tells us that

the yellow fever is unknown at Acapulco, where the temperature varies only 2 or 3 degrees during the year, and adds that, if this port, instead of being frequented by ships from Manilla, Guayquil, and other places of the torrid zone, were visited by those from the pure air of Chili, from the North West Coast of America, from Europe, or even from the Highlands of Mexico, the bilious fever of the place would soon appear in the aggravated form of yellow fever and develope itself with fatal malignity. In times of peace and tranquility when the arrivals in the West Indies are few, this disease appears very sporadically, and the cases are proportionate to the number of new comers.

But let a war arise, and great multitudes of Europeans be poured upon those Islands, particularly if the time of their arrival correspond with the commencement of the sickly season, a considerable portion of them will be seized with yellow fever within the few ensuing months, although there exist not a case of this disease in the whole West Indian Archipelago. The numbers would be increased in proportion as the strangers arrived from the purest and coldest regions in Europe, where yellow fever

never has appeared, and consequently where the impossibility of the exportation of its contagion would be infinitely great. This would occur every year during the continuance of the war, and would cease with its cessation; though yellow fever may not have made its appearance there for many years before. These facts are perfectly explicable by a reference to the influence of susceptibility on the principles pointed out, and it is therefore unnecessary and unphilosophical to call in the agency of a second power, whose laws and phenomena are altogether irreconcilable and at variance with those which govern the disease in question. It is a circumstance, both singular and unprecedented, observes Dr Pinckard, that an active and spreading contagion, prevailing in any particular country, should expressly avoid the inhabitants of that country, and only lie in wait for strangers; and should these not chance to arrive for many years, that this insatiate devourer should fast throughout the whole period, and again rush forth with undiminished vigour, the very moment that strangers appear. Can it be supposed, he adds, that a most subtle and active contagion would remain latent,

for any specified term, amidst whole hosts of natives, and 37
duly and as it were, impulsively resume all its destructive powers, as soon as a body of more robust foreigners should come within its reach. In this respect, yellow fever exactly resembles all other diseases of miasmatic origin, and universally acknowledged to be non contagious.

The natives of miasmatic districts are less obnoxious to marsh diseases than foreigners who occasionally visit them; but not so to those that are certainly contagious.

The march of yellow fever is directly in the line of the scale of assimilation. A West Indian residing for a few years at the North, and acquiring a sanguine, phlogistic disposition, will loose his conditional unsusceptibility, and return to his native country with a system as exposed as that of the European, to the inroads of a malady which it had formerly confronted with fearless impunity. The same negro, who under a West Indian sky, is nearly secure from the disease, gradually looses that security as we travel northward, till, in the middle and Eastern States, he is but a few degrees safer than the combabitants of the same regions. With a

remarkable exactness of selection, yellow fever manifests a peculiar partiality for the robust, the vigorous and the healthful. As has been truly declared, it is the disease of manhood, of the excited, unassimilated, full habit. It more rarely attacks an earlier or later period of life; and seldom females, or only in proportion, as from intemperance or other causes, they approach to the habit of the male sex; while old residents, whether native or assimilated, and people of colour, though subject to remittents and other milder forms, may be said to be almost entirely exempted from this severe form of disease. Such partialities are not to be discovered in the history of diseases avowedly contagious: they run counter to all these phenomena and laws. Contagion is independent of any accessory; it is the entire cause; the tout ensemble in the production of its own disease. It admits of no interference; but is the sole, despotic agent, scorning assistance, and crushing of itself all opposition. No state of the system; no hardiness of constitution; no weakness, laxity, or effeminacy of fibre can retard or accelerate its attack. The native and the

foreigner; the old and the young; the robust and the infirm; the male and the female are alike its resistless and indiscriminate victims. As additional evidence both of the miasmatic origin of yellow fever and of its independence on a contagious principle, I will mention some of the grounds which establish its identity of nature with miasmal diseases. It is an error in science, leading to the admission of delusive opinions to derive its nomenclature from circumstances or partial views of the subject. Its effects have been remarkably conspicuous in the particular disease under consideration. It has been invested by different nations and writers with a variety of names; drawn from what each considered the ruling or predominant symptom. Sauvages has discovered in it sufficient to entitle it to the denomination of typhus icterodes, thereby indicating it to be a compound of jaundice and typhus fever. Cullen has somewhat modified the name, and has substituted, for the icterodes of Sauvages the epithet of "cum flavedine cutis," from the yellow colour so often the concomitant of this disease. The Spaniards call it Vomito Prieto or Black

vomit, from a symptom which, as it is generally the harbinger of a fatal termination, is of very rare occurrence among those who survive an attack. Some authors have styled it Causus from the burning heat which is so frequent an attendant; and the French have given it the title of Maladie de Siam, because towards the end of 17th century, a French ship of war arrived at Martinico, with a number of French emigrants from Siam, about the time that this disease was making its appearance at that Island. The concurrence of these two events was sufficient evidence of their relation as cause and effect to invest the malady with the name of the place whence it was said to be exported. The name of yellow fever, by which most English and American writers have called it, is derived from a symptom which is not only very often wanting but is of frequent occurrence in intermittent and remittent fevers. I make this remark in order to do away all prejudice and malign influence that might accrue against the identity of this disease with those of acknowledged miasmal origin, and in favour of its specific, unconnected, isolated

nature. If these facts are kept in view, we shall be enabled to enter on the subject before us with no particular bias, or obliquity towards error. The identity of nature of intermittent and remittent fevers is generally acknowledged; they are believed to be different gradations of the same malady, originating from the same cause, and spreading throughout a district of country, not by contagious communication from individual to individual, but by the application to the body of every person who is infected, of an efficient quantum of the marsh miasma with which the atmosphere is loaded during their epidemic prevalence. This opinion is founded on an accumulation of circumstances, which renders the contrary belief impossible. They are both indisputably proved by an infinite number of facts to originate from marsh miasmata; they both prevail simultaneously at the same place; they appear in the same year; though in one year, one predominates; and in another year, the other. Remittent is found to prevail whenever the miasmata exist in a higher degree of concentration in consequence of the circumstances and conditions. I have so

often indicates, and when the bodily predisposition is greater than is necessary for the production of intermittent. They always prevail during the same season, which has been already pointed out. They also suffer conversions into each other under circumstances previously indicated. Finally, they are both of a paroxysmal tendency, exacting the same general principles of treatment. These circumstances, with many others that might be mentioned, have induced the belief that they are the same in their nature, and differ only in degree; the force of the cause being, in one case, sufficiently moderate to enable each paroxysm to terminate completely for some time before the commencement of the subsequent one; whilst, in the other, it is great enough to protract the paroxysms nearly to the beginning of those that succeed them. Of the same nature are the circumstances that induce the belief that the cause, which, aggravated to a certain extent, produces remittent fever instead of intermittent, will, when still further aggravated, produce yellow fever instead of remittent, and that these diseases are one in kind, and vary only in

respect of intensity. I have already indicated the locality of yellow fever, which in this respect coincides with the other miasmal diseases, It is believed to be of a higher gradation than the others, and accordingly is found only in those places and at those times in which, I have shown, the same cause that produced the latter exists in a much greater degree than is necessary for their production. Whilst the heats are increasing in intensity and duration, and before they have arrived at the yellow fever point, remittent is epidemic. As the temperature still continues and rises, the fever increases in malignity and violence, till many cases are of so aggravated a degree as to induce the suspicion of the existence of yellow fever. The nature of the disease becomes a subject of dispute; some declaring it to be the ordinary fever of the season, whilst others contend that it is the tropical epidemic. The cause continues to rise in intensity, and with it the fever augments in violence; all the symptoms come more nearly to resemble those of genuine yellow fever, the cases become more numerous, till at last all acknowledge yellow fever to be the prevailing disease. So remarkably is this sometimes the case that

the college of Physicians of Phila in their answer to the governor of Penn respecting the yellow fever which prevailed in that city in 1797, state, as their principle reason for believing that the fever of that year was not the ordinary remittent, "that a malignant remittent fever has never been, to their knowledge, contagious in this climate," thus being obliged to resort to the creation of a nomenclity to support a distinction that did not exist. In cities, from their higher temperature, the disease will rise to a higher degree of malignity than in the adjoining country or even in the suburbs, and hence whilst yellow fever is prevailing in the former, and particularly where the sources of miasmata are most concentrated, the milder gradations of fever will be found epidemic in the latter. This is the case in those years in which the heats are so intense as to aggravate yellow fever into a very malignant and destructive epidemic. But in seasons when they are of less intensity, and this disease prevails but in a small degree in the city, there will be contemporary and coepidemic with it both intermittent and remittent fevers. The great majority of the cases will

be of this latter kind; so much so that the existence of 45
the former during that season will be denied by many
physicians. This simultaneous concurrence and inter-
mixture of ordinary bilious fevers with yellow fever
was so conspicuously exemplified in each of the nume-
rous visitations of the latter in Phil.a that Dr Rush has
dwelt largely upon it in his history of these epi-
demics. The same truths are amply illustrated in Sir
John Pringle's work on the diseases of the army. Not only
do all these diseases prevail in the same place; but the
season of their appearance, prevalence, decadency and
cessation is every where the same; for whilst yellow fever
is prevailing in the city and among strangers, intermittent
and remittent are at their height in the country and
among natives: but as the latter are capable of existing
under less force of cause than the former, they always
begin to prevail before the heat has risen to the yellow
fever point, and continue after it has fallen below it;
nevertheless the period of their greatest prevalence is the same,
for yellow fever has always appeared in our northern cities
at that season, when, in other years, the ordinary miasmal

diseases were most rife and malignant. The fact, which places the identity of all these diseases on the firmest foundation, is their conversions into each other by the very circumstances, we would, a priori and from analogy, suppose capable of producing such an effect, viz, the state of the weather and the particular mode of treatment, together with exposure to or removal from ~~the disease~~ a highly miasmatic atmosphere. Indeed, yellow fever, particularly when the disease is only sporadic in consequence of the comparative weakness of the cause, generally, when of a protracted duration, commences under the mild form of simple intermittent or remittent leaving it uncertain whether it will continue of this type or be aggravated to the severer one of yellow fever, and, in its decline, falls again into the mitigated form from which it originated. Upon this subject there is the highest and most ample testimony. Sir John Pringle was of this opinion and has furnished us with facts which fully justify his ~~opinion~~ belief. He has also given us the testimony of Dr Huck Saunders in a communication to himself, ~~who~~ who, from his opportunities for observation in his attendance on the army in their expeditions to the French and Spanish Islands and

to America, must be admitted as no small authority. "Even in the most ardent and worse kinds of yellow fever," says he, "I think a paroxysm may generally be perceived once in four and twenty hours. And if the yellow fever were to be distinguished, in its beginning, from the common remittent or intermittent fever which was so fatal to our army, it was only by all the symptoms running higher, and by a greater degree of the fever when one might have expected remissions." After enumerating the violent symptoms of yellow fever, he adds, "I have often seen patients, labouring under most of these symptoms, immediately relieved by early evacuations, and the fever brought to intermit. He concludes, "I am apt to think that these are different degrees of the same disease, and that it sometimes depends upon the manner in which the patient is treated in the beginning, whether he shall have the yellow fever, or only a remittent, or intermittent fever." Lind expresses the same opinion of the community of bilious fevers and of the non specific nature of yellow fever in the following language. "Having considered this disease with attention, I am now of opinion, that the remarkable dissolution of the blood, the

violent hæmorrhages, the black vomit, and the other symptoms which characterize the yellow fever, are only accidental appearances in the common fever of the West Indies. They are to be esteemed merely adventitious, in the same manner as bloody stools, and bloody urine are in the small pox or as an hiccough in the dysentery. Like these, they only appear when the disease is accompanied with a high degree of malignity, and therefore always indicate great danger." In conformity with this opinion, he has given us the following decisive fact. He tells us that, at Greenwich hospital, in Jamaica, "unfortunately built near a marsh, upon a most unhealthy spot of ground." "the effects of this unhealthy situation were, that, when a patient was sent thither with only a mild intermittent fever, this mild indisposition was often changed into a malignant fever &c. The yellow fever often reigned there, attended with the most profuse evacuations of blood &c. when no such symptoms occurred in patients whose cases had been similar, and who were permitted to remain in their ships."

The aggravation of intermittents to yellow fever under exposure to highly concentrated marsh miasmata was not the consequence of contagion in the hospital, for "these things

happened even when there were a small number of patients in it, and these lodged in the best aired and in the cleanest wards". Dr Rush, who is a strong advocate for the unity of bilious fevers of whatever type, has provided us with facts confirmatory of this opinion, of the yellow fever of 1797. he has observed, "by depleting remedies, the most malignant yellow fever may be changed into common bilious fever; and, by tonic remedies, improperly applied, the common bilious fever may be made to assume the symptoms of the most malignant yellow fever." In a letter to Dr Miller, the same author, speaking of the epidemic of 1802, holds this unqualified language, "Never has the unity of our autumnal fevers been more clearly demonstrated, than in our present epidemic. Its four principal grades, viz, the intermittent, the mild remittent, the inflammatory bilious fever, and the malignant yellow fever have all run into each other in many instances. A tertian has ended in death, with a black vomiting; and a fever, with the face and eyes suffused with blood has ended in a quotidian, which has yielded to a few doses of bark." These different gradations of miasmal fever sometimes consort so much with each other,

and are so dependent on the same circumstances, as to exist indiscriminately in the same garrison among persons of the same condition as regards every thing save variety of constitutional predisposition, arising from difference of temperament or habit. Of this, we have an example in the fever which attacked a body of English troops in their garrison at Mariegalante in July 1808, recorded by Dr Dickson of 350 men, 40 were affected with fever, of which disease, "many had the yellow or endemic fever of the West Indies, in its most aggravated form, with black vomit; in others, it was of a more protracted character, and with symptoms resembling those of typhus; while the remainder had remittent or intermittent fevers. Upon the decline also of the sickly season, we generally find, that, unless the supervention of frost or a fall of rain suddenly put a period to the disease, the yellow fever diminishes in violence, and gradually lets itself down through the gradations of remittent and intermittent till it dies away and is seen no more. Finally, all these varieties are characterized by the same principal symptoms; they are all evidently of a paroxysmal tendency; and the trifling difference between

them is confined to the degree of intensity and force, and is altogether fortuitous, and dependent on circumstances whose influence has been ascertained and well defined. 57

Dr Bancroft after a long and elaborate examination of very many yellow fever epidemics in various countries, has pronounced the following judgment, which he has adduced many facts and authorities to substantiate and confirm. "His reader, he says, will have seen that yellow fever, like other marsh fevers, is always exasperated by great heat, and extinguished or greatly mitigated by cold; that, between the tropics, it prevails simultaneously with the milder forms of marsh fevers, violently attacking strangers from cold climates, whilst the natives or long residents are at most only subject to intermittents or mild remittents; they will have also seen, that in temperate situations, this disease in the early part of summer, before the atmosphere has become intensely hot, is commonly preceded by, or rather shews itself in, the forms of intermitting or remitting fever; and that when exasperated by excess of heat, it has assumed, and for some time prevailed under, the appearance of an epidemic yellow fever, the accession

of cold weather speedily reduces it again to its milder forms; and that a freezing temperature soon puts an end to its appearance, even in those forms, as it commonly does to other fevers occasioned by exhalations from marshes, and to no others. And they will also have seen, that the common bilious remittent of hot climates, which is universally admitted to be the effect of miasmata, differs from the yellow fever, only by being a little less violent; that, at the utmost, their symptoms vary only in degree; and that, in truth, even this difference is often imperceptible (p. 280) If it be asked why, if yellow fever belong to the class of paroxysmal or miasmatic diseases, it does not like these always remit or intermit, it may be satisfactorily answered, as Dr Ferguson has done, "that for any disease to observe regular laws, it is necessary that the vital organs principally affected should continue in a certain degree of integrity, that their functions should only be disturbed and perverted to a given point; that they should still be discernible as functions, and not be utterly overwhelmed and extinguished by the violent cerebral action and speedy gangrene of the stomach that take place in aggravated yellow fever.

As the ulcer of a specific poison that would run a reg-
ular course according to acknowledged laws, if it be driven
to a high inflammation or sphacelus, no longer belongs
to the original stock, and is emancipated from those laws;
so the violent actions of the above fever impair and destroy
the animal functions by which its crisis and remissions
are regulated, or speedily engender a new disease; as new
as the conversion of an ordinary venereal chancre into
a phagedenic slough, through the application of a potential
cautery." Johnson on Trop Cli p. 368 Therefore, except from
the malignant violence of yellow fever and the reputation
that once belonged to it of being a contagious disease, should
some writers thus turning their backs upon facts and giving
indulgence to their superstitious fears endeavour to invest
this disease with a specific character, and circumscribe it
within such limited phenomena and laws, the mild and
confluent small pox, which are considered as the same
disease, are not more alike than the different gradations
of marsh malady; nor is there a greater similarity
between dysentery and intermittent fever, which are
fraternal diseases, than commonly exists between the

latter and yellow fever; Why not pursue pathological minuteness and discrepancy a little farther and consider as a distinct and isolated disease, every individual case in which there is the slightest difference or variety of symptom: then we shall have the species of disease nearly infinite, for who can recount all the intermediate gradations between the extremes of severity of the same malady? Of an individual epidemic, the yellow fever of 1793 Dr Rush has observed that "from the history he has given, it appears that it counterfeited all the acute and chronic forms of disease to which the human body is subject." (vol 3 p. 131)

If, as I have every reason to believe, the various gradations of bilious fever are the same in their nature; if all these diseases resemble each other in all the points in which I have endeavoured to demonstrate a similitude; a similitude, extending to all essential circumstances and sufficient to invest these several diseases with the character of identity of nature, then we have a right to infer that they are dependent on an identity of cause, modified in its effects by a variety of ascertained ~~circum~~-

conditions which I have already pointed out, As, therefore intermittent and remittent fevers originate from marsh miasmata, so it may legitimately be concluded does yellow fever also: and as the former are perfectly independent on contagion, we have strong reason for believing that the same is likewise true of the latter disease. If yellow fever were a contagious disease, intermittent fever would be contagious also. The contagion of one would also produce the other disease, as the contagion of either distinct or confluent small pox (between which the connexion is not closer than between the two other diseases) is capable of generating indiscriminately either the one or the other variety according to certain modifying circumstances. Having pointed out what has appeared to me sufficient to account for all the phenomena attending the history of yellow fever, I might here close my remarks on its origin, leaving unnoticed another reputed cause of it; a contagious principle, it belief in its derivation from one of these sources precludes the possibility of a belief in that of the other, The

causes of diseases are limited in their powers of production; their offspring are as certainly derived from their own causes, as any species of animals or vegetable is the progeny of that particular species alone, miasmatic and contagious diseases are as incapable of interchanging their parentage, as the various contagious diseases are of interchanging their specific derivations. But as some writers maintain the contagious origin of yellow fever, it will be proper to regard on its own merits the claims of this agent to the reputation and rank to which it has been exalted in the causation of the disease in question.

Though, therefore, the origin, to which I have assigned it, must exclude any assignment or reference to a contagious source, yet, for the sake of fair argument, I will consider as inconsequential and inefficient any conclusions or inferences that might result from the facts already stated, and, by starting afresh with this agent as I did with the other, endeavour to show that contagion cannot account for the history and phenomena of yellow fever, and should not be admitted as the cause of this disease though we were unable to discover any other that was satis-

factory, we must reject a wrong solution of a prob- 5 72
lem, though we are ignorant of the right.

The nature of this essay and the length to which it has already extended will necessarily confine me to conclusions and general positions, without a detail of facts. The dependence of yellow fever on contagion would, were it possible at all, be susceptible of an easy and satisfactory demonstration. The proof is perhaps of as ample and plain a nature as that of the dependence of any effect on an invisible agent. Narratives and histories of this disease have been made with great ability, observation, and zeal: its reputed importation and propagation by contagion have been strenuously insisted on: the proof is entirely affirmative and positive: the facts proper and sufficient to establish this belief are not few in number and confined to a few places; but of every day occurrence; they happen by millions every hour in every quarter of the world; so that it is an extraordinary, nay almost unparalleled circumstance that a truth capable of such remarkable advantage of demonstration should not have been as firmly established and as universally acknowledged

as the exclusive dependence of small pox on a principle of contagion. The doctrine of the contagion of epidemics was invented for a political purpose, by the head of the Christian church, in the middle of the 16th century. Before that period, epidemics were referred, (save by that superstition which attributed them to the anger of the Gods) to atmospheric vicissitudes. Medical history traces to a very remote era the occasional epidemic prevalence of yellow fever in all the countries and situations in which it prevails at the present day. In the cities of these United States it is known to have appeared as far back as these records of disease extend. In the West India Islands it frequently broke out among their earliest colonists, and the Southern cities of the Spanish Peninsula, were severely ravaged by it several centuries ago. The epidemic diseases, with which Spain has been greatly afflicted, have occurred very frequently till the present time, and, though all appear to have been nearly of the same character, those before the middle of the 16th century were attributed to the atmosphere; whilst those, since that period, have been imputed to

contagion. "'tis strange; 'tis passing strange".
There are motives of nearly instinctive tenacity, and influence that impel us to lay the origin of evils at another's door, and to derive it from a foreign soil.

The history of epidemic diseases tells us that all of them, on the ground of their being contagious, have been imputed to a foreign source and imported from distant countries. Though the offspring of nearly every country, and every where domiciliated, they are no where acknowledged. The North Americans have chosen to look to the West Indies for their yellow fever; the West Indians to Africa; the Spaniards to the West Indies and America. The English used to import their plagues from Holland; and the Hollanders from England; the Muscovites from China; and perhaps the Chinese from Muscovy. Whilst Dr Pym with indefatigable industry imported by breach of quarantine, the fatal yellow fever of Gibraltar in 1800 from Carthagena in transports which were placed in strict quarantine on their arrival. Dr Burnet, a contagionist, declares that Dr Rissuno, Physician to the Spanish Royal Hospital at Carthagena "positively asserts that the fever of Carthagena was brought from Cadiz and

Gibraltar in 1810." These different and opposite importations are supported by their respective advocates, by long arguments and circumstantial narratives. "These contradictory assertions," as Dr Bancroft has properly remarked, "serve only to manifest the readiness with which the contagionists, who believe that an epidemic yellow fever must always proceed from imported contagion, hazard tales to account for it." This want of unanimity in fixing on the source of the disease or the place of its importation should be regarded as fatal to the doctrine of contagion.

Dr Hosack contends for the contagious communication of yellow fever in an impure atmosphere, and disbelieves the disease can be propagated in a pure atmosphere. He has cited instances of its conformity to the conditions under which he says it appears and disappears, and ventures the opinion that the impure air, by chemical combination with the specific virus, becomes assimilated to it, ~~by chemical combination~~ and thus the leaven or original ferment is, not changed, but multiplied and greatly increased. That yellow fever is propagated throughout an impure or miasmatic atmosphere and is limited to such

an atmosphere being incapable of appearing beyond it, is
what every body who denies the contagion of the disease,
most strenuously contends for. He would expect yellow
fever to be coextensive with miasmata that produced
it; nor has Dr. Hosack offered a single fact or reason
to induce ~~it~~ ~~in~~ ~~the~~ the belief that it is caused by con-
tagion and not by the miasmatic air. He has merely
asked, why if the disease be not contagious, is the same
disease always produced. We admit both that conta-
gion must produce a specific contagious disease,
and that miasmata also must produce a miasmatic
disease, of which nature we have contended yellow fever
to be. But the disease induced is not always yellow
fever, for when the cause is not very concentrated all
the gradations of miasmatic disease appear promiscuous-
ly in the same city or District. Nurses and attendants on
yellow fever patients are, from their common exposure
to the miasmata, sometimes attacked with yellow fever,
and sometimes with intermittent and remittent. For the
assimilating process, that is contended for, we have the
author's word alone. He has given us, indeed, a few

illustrations of his meaning and of the nature of the agency of his hypothetical ferment, by referring to the assimilating powers of cows, and also of the small pox virus in converting the fluids of the human body to the peculiar taint which may be introduced into the system. In support of the reality of any such poison in the atmosphere, the author has supplied neither analogies, reasons, nor facts, which an extraordinary opinion certainly required. Had it been true of any known contagion, the author would gladly have mentioned it; had it been true of the variolous virus that it converts the noxious atmosphere for a great distance into a specific poison capable of communicating small pox, we certainly should have been told of it. But even contagionists admit that the disease can be contracted only within the sphere of a few feet, beyond which there is perfect safety; yet we are told, without reason, that yellow fever is contagious, and that there is no other way of reconciling this opinion with the fact of its spreading over a large city in a few weeks except by admitting that this whole extent of atmosphere has

become assimilated to its peculiar contagion.

I will now cite a few cases in which, had yellow fever been a contagious disease, it could not have failed to manifest such properties by communicating itself when removed beyond the influence of marsh miasmata. Dr Bancroft, after having investigated the yellow fever epidemics of the West Indies and the United States, makes the following observation, for the support of which he has given throughout his history, the authorities of the physicians who have recorded the particular epidemics. "One fact," says he, "which decidedly proves the yellow fever to be destitute of any contagious power, is that of its never having been communicated to others by any one of the many thousands who, in in the West Indies, as well as at Charleston, Norfolk, Baltimore, Philadelphia, New York, &c were removed beyond the reach of marsh miasmata, whilst labouring under the disease, or after having imbibed its poison; though, in many of them, the disease appeared in its worst forms, and proved mortal".

Another, and if possible, a stronger proof of the non existence of contagion in yellow fever, says the same

author is derived from the Hospitals. He has established this fact throughout his history, and has subjoined in further confirmation of it the following extract from Dr Miller's Report. "No communication of the disease was ever observed in yellow fever Hospitals, situated at a small distance from the cities to which they belong. No exception to this has ever occurred in any of the numerous seasons of this pestilence at our Hospital at Bellevue, the marine Hospital at Staten Island that of Philadelphia, or any other in the United States; provided the malignant air of the city had been avoided. The numerous retinue of medical attendants, nurses, washerwomen, servants, &c which belong to an Hospital, must be known to every body. How greatly they are all exposed to contagion, if it could be supposed to exist in this case, is equally known. Yet, not only all these have invariably escaped the disease, but likewise all the persons occupied in the removal of the sick." Dr Miller adds, in a note, that several persons died of the yellow fever in the Alms-house in 1798, and that "although the house then contained about eight hundred persons, no communication of contagion took place".

The frequent post mortem examinations of yellow fever patients have always failed to communicate the disease. But as if to place the question of contagion beyond the possibility of a doubt, experiments, devised with judgement, and executed in such a manner as to leave nothing omitted or not satisfactorily ascertained have been instituted by many physicians. Those performed by Dr Hosack at Phila in the presence of several respectable medical gentlemen, are of a very remarkable character. they are such as almost any reasonable person would regard as conclusive of the negative of a question, and such as a thorough going contagionist would be most likely to call for to decide the matter, had they been wanting or never performed.

They are of so direct a nature as to decide positively one way or the other, for it appears to me impossible if there is any uniformity or stability in the character of the disease, for the result of the experiments to be one way, and the fact with respect to contagion to be the other way.

Had the disease been small pox and not yellow fever, these experiments could not have been made without

the disease having been communicated to the individual by whom they were performed. Dr. Hoffirth inoculated himself with fresh black vomit from a moribund yellow fever patient; a slight inflammation ensued, which subsided in three days, and the wound readily healed. He then confined, by a sticking plaster, some of the same matter, over a cut in his arm, for two days; no inflammation ensued. He repeated these experiments above twenty times, in various parts of his body. He also put recently ejected black vomit into his eye, and inoculated himself with the saliva and serum of yellow fever patients without inconvenience or effect. He exposed himself with impunity to the exhalation of fresh black vomit heated in an iron vessel, and then swallowed the inspissated remaining matters made into pills. Finally he drank two ounces of recently vomited undiluted black matter, and found it harmless, after having taken without effect considerable quantities of similar matter diluted with water.

Though yellow fever, for reasons already given, most frequently prevails in large and commercial cities,

yet it sometimes breaks out in the interior of the country and in situations which preclude the possibility of its having been carried thither by persons affected with it. In the intensely hot seasons of – 97, – 98 and – 99, it appeared in Bald Eagle Valley in Pennᵃ (N.Y. med. repos. vol 4. p.)

During the memorable years of 1814, and 1821, whilst intermittent and remittent fevers were unusually prevalent and malignant throughout many of the upper counties of Virginia and along the Potomac, particularly at Harper's Ferry, yellow fever raged at the city of Alexandria. – yellow fever recurred, says Dr Potter, on the Eastern Shore of Maryland in the year – 93, "after a spring unusually wet, and a summer as uncommonly hot" (Memoir on Contagion) The same author furnishes evidence of a still more decisive nature, He has extracted, from the journal of a voyage down the Ohio in the year – 96 by Mr Ellicott an account of a severe yellow fever that afflicted the town of Gallipolis. The mortal cases were generally attended with the black vomit. "This disease", says Mr Ellicott "certainly originated in the town, and in all

probability, from the filthiness of the inhabitants, added to an unusual quantity of animal and vegetable putre-faction in a ~~[illegible]~~ number of small ponds and marshes within the village. The fever could not have been taken from the Atlantic states, as my boat was the first that descended the river after the fall of the waters in the spring: neither could it have been carried from New Orleans, as there is no communication at that season of the year, from the latter to the former of these places; moreover, the distance is so great, that a boat would not have time to ascend the river after the disorder appeared that year in New Orleans, before the winter would set in." Mr Volney, during his travels through the interior of our country, found the yellow fever in several places. Having seen it previously in our seaports, he could not have been deceived. For further examples confirmatory of the indigenous origin of yellow fever, the valuable memoir of Dr Potter may be consulted.—

Having thus hastily run over some of the reasons, which I held decisive of the indigenous origin and non-contagious power of yellow fever, I shall,

without stopping to comment on what has gone before, cut short my remarks on the cause of this disease by comparing a few of its phenomena with those of contagion, in order to illustrate not only their incompatibility but their direct opposition. It will hence appear that the history of yellow fever cannot be accounted for by a reference to the peculiar and specific properties of a contagious principle, but that it is in perfect harmony with the laws of epidemics, and that, like intermittent fever, &c, the disease is dependent for its cause upon a miasmatic atmosphere and appears or disappears according to the weather and season.

It has been remarked of epidemics, by nearly all writers, that at their rise, all other diseases are merged in them or obliged to assume some of their symptoms, and at their declension, they degenerate into others. This has been noticed of yellow fever in particular by numerous authors. Thus Dr Rush mentions, that in the year 1793, "the influenza, the scarlatina, and a mild bilious remittent prevailed in Phila before the

yellow fever made its appearance. In the course of a few weeks they all disappeared, or appeared with symptoms of the yellow fever, so that, after the first week of sept, it was the solitary epidemic of the city." All these diseases, though epidemics, were of less force in consequence of a less powerful cause, than yellow fever. In all such cases the atmosphere is impregnated with the seeds of the disease. This is evinced by the fact already stated and the extensive prevalence of the disease, as well as by the contemporaneous effects on the vegetable and inferior ranks of the animal kingdom, effects which it is impossible to account for save on the supposition of a noxious atmosphere, vegetation is blighted, and the brute creation languish and die. Even Sir James Fellows has recorded that during one of the yellow fever epidemics in Spain, so poisonous was the air that canary birds died with blood issuing from their bills, and yet, strange to tell this very yellow fever was imported and propagated by contagion. Here then was an acknowledged cause quite adequate to the morbid effects in question, notwith-

standing which, an unknown hypothetical agent, resting for its credit on our inability to discover a sufficient cause, is unnecessarily called in to account for the phenomena - the disease, this evinces a disreputable ignorance of the common principles of philosophy. It is laid down by the great Newton, that "more causes of natural things are not to be admitted, than are both true and sufficient to explain the phenomena." Dr Rush tells us that every person contained the morbific miasmata in his body, during the fever of - 93, as was evinced by various premonitory symptoms, which fell far short of actual disease, but which only waited for a debilitating and accessory agent to enable them to develope their effects in full blown yellow fever. It will hardly be pretended that this could have been the case had the disease been independent on the atmosphere and relied for its propagation and diffusion solely on a contagion radiating from individuals to the distance of only a few feet and which, in consequence of such limited radiation, can extend to a comparatively small number of the inhabitants of a city, the majority

of which number small as it is, have acquired an 71
immunity against its effects from a previous attack 72
in all contagious diseases, and, in one in particular, from
inoculation and vaccination. Another very important
law of epidemics, and one which forms a prominent
distinction between these and general contagious diseases,
arises from their capability of affecting the same persons
repeatedly. All authority is against any such exemption
or immunity from repeated attacks in the instance of
yellow fever. Were it not superfluous all the West
India and United States physicians who have seen the
disease might be cited to declare that yellow fever
does affect the same person repeatedly, though for reasons
elsewhere stated, repeated attacks are not very frequent
in tropical climates, though they may occur annually
at the North. Those who have claimed for yellow fever
the property of contagion, cannot have contemplated how
monstrous would be its effects under such an additional
means of destruction. A malignant volatile contagion, attack-
ing the same individual repeatedly! The existence of a being
endowed with such exterminating weapons is incompatible

with the continuance of the human race. Suppose the small pox had not conferred an immunity by a single attack, but affected the same individual repeatedly, what precautions could prevent its progression and constant circulation whilst subjects remained to be operated upon, which would not cease to be the case till our species was annihilated. An individual would have scarcely recovered, ere he would be attacked again, so that there could be no safety, save beyond the sphere of the contagion, and by what limits, save by the boundaries of the world, could that sphere be circumscribed. Even with all the obstacles to its progress, what country has escaped its ravages? It is by insulating the sick by means of persons who have acquired an insusceptibility that a contagious disease is prevented from spreading even amongst the minority who are liable to it; but in the case of yellow fever which attacks the same person repeatedly there could be none who would be invulnerable; none who could interpose with safety and cut off communication by standing like an impassable barrier between the healthy and the sick.

All would be equally liable to the contagion within the sphere of its influence: the disease would advance in an increased progression, till, at first, communities, and next the whole human race would be exterminated. But, happily, no such effects take place. The yellow fever, after having prevailed for a season, will sometimes die gradually away and finally disappear, or suddenly cease when at the height of its epidemic malignity and prevalence, having the great majority of the community untouched and unharmed. As, therefore, effects would take place, did the disease depend on a volatile contagion, which certainly do not take place, the conclusion necessarily follows that yellow fever is not dependent on a volatile contagion. The farther we trace the history of epidemics in all their phenomena, and throughout all their nature, and character, to their minutest peculiarities and their utmost ramifications, the more we shall find them to diverge from the genius and direction of specific contagions.

The circumstances of the limitation or confinement of epidemic diseases to particular countries and of their

preference or partiality for certain descriptions of persons is, hostile to the doctrine of their capability of communication by contagion. The history of both yellow fever and plague is very remarkable in these respects. The accounts of the almost instinctive propensities of this latter disease are exceedingly curious; and its inseperable likes and dislikes for certain countries and classes of people have been accounted for. Dr Maclean in his interesting narrative of the plague as he saw it at Constantinople has stated the order of susceptibility to its attack, and has referred these varieties to the habits, customs, situations, and in fine to all those circumstances in life which are known to exert a powerful influence on both the bodily and mental energies, and which operate with peculiar force among the mixed and opposite characters of the population in many of the plague cities of the East. The severe abstinence from strengthening food for example during certain seasons, enjoined by certain religions, is one among the many circumstances which vary the liability to plague and is of far more powerful tendency than is probably in general supposed. Whilst the fasting days among the catholics of the

Levant, including Greeks and Armenians, are upwards of 200 in the year, during which they subsist on herbs or roots and dry bread, the Rhamadan, or Lent of the Mahomedans, lasts but a single month. Besides, we are told, if the Turks fast during their Lent from sun-rise to sun-set, they make ample amends for this privation from sun set to sun-rise. On these accounts, as well as from their inhabiting the most elevated and healthy situations they enjoy an exemption in a far greater degree than the lejune and emaciated Catholics. There are several other traits in the character of yellow fever, in common with all epidemic diseases, which stand out as prominent features to distinguish it from those which are governed by the rigid rules of contagion. The farther we proceed in the particular history and nature of the two species of maladies, the farther will they be found to diverge from each other, and the more distinctive and opposite the laws which regulate them. The forms of contagious diseases are always alike; the particular disease can be pronounced with certainty from the beginning: it is known before hand how long will be the interval

between the application of the contagion and the development of its effects; what will be the order of the symptoms; and what the duration of the disease. In all these respects, yellow fever is very vague, uncertain, and varying, so much so as to throw a character of great multiformity over the disease, and oftentimes to render its identity in individual cases a matter of dispute.

Again; the progress of yellow fever outlaws all contagion. Dr Burnet's account of some of the Spanish epidemics is very satisfactory on this head. A great number of facts are at hand for quotation, but I shall be satisfied with one, picked not on account of its superior applicability, but because it is told in a few words. Of the Gibraltar epidemic in 1813, it is observed "that the disease did not spread from any focus, but broke out in fifty different places at once." (p 312) This we are told is true of all the yellow fevers of that city (p. 324) That this is the case with the epidemics of this country also, we have the authority of Dr Caldwell to testify. He declares (memoirs, p 100) "that yellow fever will in two or three weeks overrun an extent of city which

the small pox will not pervade in twice as many months, "To what cause," he asks, "can such a remarkable difference be owing? certainly to this, that small pox is propagated only by contagion from the sick to the well, a source of disease which most persons have it in their power to avoid; while yellow fever is spread by vitiated atmosphere, which, being a common medium, has access to every one". "We have recent examples enough of the wide spread, and almost electrical rapidity and pervasion of this terrible epidemic. Spain has reason to mourn over the mortality and affliction of the hundreds of thousands of her population who sunk beneath the pestilential visitations of yellow fever that marked the commencement of the present century and rendered it memorable in the history of her calamities. The reports of Sir James Fellows on this subject are unfortunately too copious and too true. In the year 1800, upwards of 48,000, out of a population of 60.000 in the city of Cadiz, were attacked by yellow fever in the short period of three months. (Fellows p. 420) In the same year, 76 out of 80 thousand of the inhabitants of

Seville were afflicted with the same disease, whilst, at the same time, the city of Xeres suffered the enormous mortality of upwards of 10.000 out of the 35.000 of her population (p.440) Seven thousand of the population of Malaga perished in the autumn of 1803; (p.95) and a still greater number in the following year. In 1804, three fifths of the population of Gibraltar were swept off by yellow fever during four months (pp 75 & 449)

The same year is memorable from the yellow fever epidemic which afflicted 23 of the cities of Spain, She is computed by Bancroft and Fellows to have lost 120.000 of her population. In 1813, nearly three thousand of the inhabitants of Gibraltar were seized by yellow fever, notwithstanding eight thousand of her people fled the city at the commencement of the epidemic and escaped an attack. Without lengthening this list, which were easy, suffice it to enquire whether these things could be true of a disease, propagated from individual to individual by a contagion which is believed to radiate but ten feet from the person affected in a sufficient degree of concentration to communicate

disease? Another query for solution on the contagious hypothesis must occur to every body, what puts a sudden stop to these epidemics; What extinguishes at once a disease, when the quantity of contagion is so abundant; sufficient to over-run the whole world?

It can not be the reduction of temperature or any quality or state of the atmosphere; for these touch not the matter of contagion, and therefore cannot affect its efficiency and powers? We would expect such a cessation in all miasmatic diseases, and accordingly we find such a cessation, under the very circumstances in which we would a priori pronounce it must happen, we would not expect in contagious diseases, and accordingly we do not find it in them. Another proof that yellow fever is not contagious is that it never has been propagated in a pure air or beyond the sphere of the miasmatic atmosphere. This fact is so litterally true, that, in cities, the vitiated districts are sometimes so accurately marked, that the epidemic cannot overleap their boundaries. These positions are admitted by even the contagionists, the cases in illustration of them

are so numerous, unequivocal, and well defined, as to place the matter beyond suspicion, and render any citation of them superfluous; for why should that be attempted to be proved, which nobody denies: such an attempt would be in the language of Dr Johnson, but to "convince those who had no doubt before."

Were there no other fact than this, on which to found the belief in the non-contagiousness of yellow fever, it would settle the point beyond the possibility of controversy. If a miasmatic air is a sine qua non to a disease, that disease cannot be contagious.

Almost all the physicians and surgeons of the British fleets and armies in intertropical latitudes have no belief in the contagion of yellow fever: in the West Indies, the opinion has been long since abandoned not only by medical men, but by the intelligent part of the inhabitants. In the United States, of those physicians who have seen the disease, a very minority, adhere to the doctrine of the last century.

The French Academy of Medicine during the last year, unanimously declared and published their

incredulity, Of those, who have had experience of the disease, the Spanish physicians alone still cling to the doctrine promulgated by the head of their religion. It belongs to the creed of the nation, is interwoven with their superstition, and enforced by the rigors of the law. Unhappy Spain, is now weighed down beneath the pressure of a brutalizing despotism, is still overshadowed by the gloomy darkness of the middle ages, and has never shared in the reformation in religion or government, which has enlightened and animated many of the other nations of the world. A sombre melancholy is reflected over the intellect of the country in every department of science. A nation several centuries behind its fellows, it would be unreasonable to expect her to keep pace with them in the department of medicine. It must be revolutionized in government before it can advance in literature and science. Then we may expect it to reject the doctrine of the contagion of yellow fever, when proscription and banishment shall have ceased to be numbered amongst its frequent consequences.—